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# SPECIES COMPOSITION OF PHYTOPLANKTON IN THE TWO MIGRATORY BIRDS VISITED PONDS OF KANYAKUMARI DISTRICT

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## ABSTRACT

The present investigation was carried out from January 2012 to December in order to determine the seasonal variation and species composition of phytoplankton in the two migratory birds visited ponds of this district. Samples were collected from the two pond for the analysis of physico-chemical parameters and phytoplankton. The dissolved oxygen concentration ranged for a 4.8mll/l to 6.18mg/l, Nitrate 1.03 to 1.45mg/l, Phosphate 0.12 to 0.18mg/l. A total of 39 genera, 55 species in pond A and 45 genera 55 species in pond B were recorded under 4 groups viz. Chlorophyceae, Cyanophyceae, Bacillariophyceae and Euglenophyceae with maximum diversity of Cyanophyta.

**KEYWORDS:** Phytoplankton, Physico-Chemical Parameter, Pollution, Diversity, Cyanophyta

## INTRODUCTION

Phytoplankton as primary producer plays a pivotal role in the aquatic ecosystem as most of the solar energy is changed into food energy by these organisms. Phytoplankton includes several thousands of microalgae belonged to chlorophyta (green algae), cyanophyta (blue green algae), Bacillariophyta (diatoms), dinoflagellates, cryptomonads etc. They respond quickly to environmental changes and are used to assess the ecological status of water quality. Several algal species are used as pollution indicators, (Palmer, 1969). The distribution and dynamics of algal species varies depending upon the physico-chemical parameters like temperature, light intensity, biological oxygen demand, dissolved oxygen, alkalinity and concentrations of micro and macro elements, (Tiwari *et al*., 2004).

Several investigations were carried out in the phytoplankton diversity and their relationship with abiotic factors, ( Pahari and Dutt 2000; Perumalsamy and Thangamony 2004; Jena *et al*., 2006; Tiwari and Chauhan 2006b; Malliswar *et al*., 2007; Panikar *et al*., 2012). In kanyakumari district the migratory birds visited few freshwater environments and no previous detailed ecological study regarding the phytoplankton diversity in this regard. Hence the present investigation was carried out (2012 January to December) to determine the species composition of phytoplankton in two different water bodies of migratory visited ponds of the district.

## MATERIALS AND METHODS

Phytoplankton samples were collected from the two freshwater ponds (Pond A- Parakai kulam; Pond B- Puthari kulam) on the monthly basis from January 2012 to December 2012 by using 1 litre sterilized wide mouth plastic containers at each pond (APHA, 1985) and fixed in 4% formalin solution. Identification and enumeration was carried out by relevant literatures (Round 1971; Anand, 1998; Prescott 1978 and Krishnamurthy, 2000).

## RESULTS

Physico-chemical parameters of water is the prime consideration to assess its quality for irrigation, fishing, boating and industrial purposes. The phytoplankton abundance and succession linked with the influence of abiotic factors. In Pond-A and Pond-B a total of 39 genera 55 species and 45 genera 69 species phytoplankton members were reported and documented in Table 2 and they belonged to 4 classes viz.. Cyanophyceae, Chlorophyceae, Bacillariophyceae and Euglenophyceae. In pond-A, 16 genera 24 species to cyanophyta, 11 genus with 14 species to chlorophyta, 9 genera, 13 species to Bacillariophyta, 3 genera with 4 species to Euglenophyta were recorded. In the second pond (Pond-B) 18 genera 31 species to Cyanophyta, 17 genera 24 species to Chlorophyta, 7 genera 8 species to Bacillariophyta, 3 genus with 6 species to Euglenophyta were reported. Cyanophycean members contributed maximum diversity in both the ponds. Genus like *Chrooococcus, Microcystis, Oscillatoria, Merismopedia, Anabaena, Nostoc* and *Aphanocapsa* were found to be dominant while *Eucapsis, Coelosporium, Rivularia, Arthrospira* and *Synechocystis* were reported abundant. *Phormedium, Anacystis, Lyngybya* and *Aphanothece* were just recorded.

In the case of Chlorophyceae *Ankistrodesmus, Chlorococcum, Pediastrum, Secnedesmus, Closterium, Spirogyra, Crucigenia, Tetraspora* were dominant. *Oedogonium, Ulothrix, Cladophora, Botriyococcas* and *Chlorella* were found to be abundant while *Netrium, Tetradon* and *Hydrodictyon* were recorded occasionally.

Among the diatoms *Navicula, Pinnularia, Fragillaria, Synedra* and *Gamponema* were formed to be the dominant genera while *Amphora,* and *Achnanthes* were abundant. *Diatoma* and *Surirella* were recorded rarely.

As for as Euglenophyceae is concerned the genus *Euglena* and *Phacus* were recorded at certain areas of the pond.

During the study period phytoplankton cell density reached maximum in April ($14.48\times10^3$ cells/ $m^3$) and October ($12.87\times 10^3$ cells/$m^3$) showing a bimodal peak in Pond-A and a unimodel peak was noticed during December ($16.9 \times 10^3$ cells/$m^3$) in the second pond-B.

The physico-chemical parameters of the study pond showed higher mean $p^H$ ($7.74 \pm 0.51$), temperature ($27.29\pm2.07$) along with higher dissolved oxygen concentrations ($6.18\pm0.38$ mg/l). The levels of potassium was maximum (7.42 mg/l) in Pond-A while nitrate and phosphate content remains maximum in Pond-B and minimum in Pond-A (Table.1).

## DISSCUSSIONS

Phytoplankton are sensitive to the environmental changes and their distribution varies considerably with respect to seasons, water quality and nutrient concentrations (Thirugnamoorthy and Selvaraju, 2009; Ganai *et al*., 2010b). Its biomass in a particular time is a dynamic process altered by the interaction of light, nutrient availability, growth and reproduction of plankton and cropping by herbivores (Diana *et al.,* 1997). Similar to the present investigation Devi *et al* (2007), Rout and Borah (2009), Mahar and Beena (2010) have reported four algal groups, viz. Chlorophyta, Cyanophyta, Bacillariophyta and Euglenophyta in their studies. Among the four groups, Cyanophyceae members dominated and earlier observation of Hudder (1995), Kavitha (2006), Hujare (2008b) and Joseph (2012) also pointed out the same in their studies. The cell density of phytoplankton reached maximum during monsoon or non-monsoon or both the months exhibiting uni or bimodal peaks. Pond-A represent bimodal peaks in summer and northeast monsoon season whereas Pond-B showed unimodel peak during northeast monsoon season. Similar findings of unimodel peak was reported by Bhagat *et al*., (2009)

and Ganai *et al*., (2010b). Srivastava (2002) and Chellapa *et al*., (2009) has also pointed out the existence of bimodal peaks of phytoplankton. Many workers have reported blue green algae as a dominant group during non-monsoon season (Zacharias and Roy 2007; Hussan et al., 2008; Khanna and Indu, 2009) and north east monsoon season (Santhosh et al., 2007 and Jeyabaye, 2010). The dominant nature of Cyanophycean members are the characteristic feature of eutrophic environment which have high concentrations of nutrient especially phosphate and nitrate (Neelam *et al*., 2009). The waste excreata, dead remanents of birds and fishes has increased the organic content of the pond and hence the number of cyanophycean members reached maximum in their density. Similar trend was reported in koonthankulam bird sanctuary pond by Esaki (2006). Moreover a direct effect of temperature on algal growth may influence the growth of phytoplankton when the temperature was above $23^0$C to $30^0$C it favours the growth of Cyanophyceae. In the present observation maximum population of algae was during summer months when the temperature was between 25-$30^0$C. The $p^H$ range between 6.7 to 7.8 (Healey, 1982) alkalinity range of 50 to 110mg/l (Jackson, 1971), high nutrient concentration (Ghavzan and Gunale, 2006 and Neelam *et al*., 2009), rich organic matter (Kant and Amita, 1999) and dissolved oxygen (Ansari *et al*., 2008) of the two pond produces maximum diversity of cyanophycean members. The genus *Microcystis aeroginosa* produced blooms during November month in Pond-A while *Chroccoccus turgidus* produced blooms during December in the second pond.

The second dominant group in both the pond was Chlorophyta with a total of 43 and 25 species respectively. Among the Chlorophycean members the genus *Pediastrum* was reported with four species, *Scendesmus* and *Closterium* with three species each. Similar findings were made by Ida *et al*., (2004) and Shamel (2012) in their studies on phytoplankton diversity. The third group reported was Bacillariophyta with 11 genera and the genus *Navicula* includes four species Euglenophyta was represented with three genus which indicated the presence of polluted nature of ponds (Balasingh and Shamel, 2007; Desh *et al*., 2010). Previous studies on freshwater environment showed that higher temperature and nitrate concentration favours the growth of euglenoids in the two experimental ponds (Jasprica *et al*., 2006). Blue green algae such as *Oscillatoria*, *Microcystis*, *Chroococcus* and Euglenophycean members like *Phacus* and *Trachelomonas* were reported as pollution indicators (Palmer, 1969). Devi and Charya (2007) observed that the members like *Microcystis* and *Lymbya* were the indicators of bad water quality.

## CONCLUSIONS

From this study it can be concluded that the rich organic waste of the freshwater environment, enriched by the excreta, has increased maximum Cyanophycean diversity.

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**Table 1: Annual Mean Values of Physico-Chemical Parameters in Pond-A and Pond-B during the Year 2012**

| Parameters | Pond-A | Pond-B |
|---|---|---|
| Temperature | 27.29 ± 2.07 | 24.97 ± 2.68 |
| $p^H$ | 7.74 ± 0.51 | 7.64 ± 0.38 |
| D.O (mg/l) | 6.18 ± 0.38 | 4.8 ± 1.01 |
| BOD (mg/l) | 2.26 ± 0.42 | 2.6 ± 0.74 |
| Total alkalinity (mg/l) | 62.14 ± 11.08 | 53.78 ± 8.17 |

| Table 1 – Cond., | | |
|---|---|---|
| Calcium (mg/l) | 12.23 ± 2.40 | 11.38 ± 1.68 |
| Potassium (mg/l) | 7.42 ± 2.19 | 6.18 ± 2.40 |
| Nitrate (mg/l) | 1.03 ± 0.28 | 1.45 ± 0.54 |
| Phosphate (mg/l) | 0.18 ± 0.03 | 0.12 ± 0.02 |

**Table 2: Phytoplankton Species Recorded in the Ponds-A and Pond-B during the Year 2012**

| S. No | Name of the Algae | Pond-A | Pond-B |
|---|---|---|---|
| | **CYANOPHYTA** | | |
| 1. | Aphanocapsa biformis A.Br. | + | + |
| 2. | Aphanothece sp | + | + |
| 3. | Chroococcus tenax (Kirchn) Hieron | - | + |
| 4. | Chroococcus indicus, Zeller. | + | - |
| 5. | Chroococcus minor (Kuetz) Nag | + | + |
| 6. | Chroococcus turgidus (Kuetz) Nag | + | + |
| 7. | Chroococcus minutus (Kuetz)Nag. | + | + |
| 8. | Coelosphaerium sps. | + | + |
| 9. | Eucapsis minuta Fritsch | + | + |
| 10. | Gomphosphaeria aponina Kuetz. | + | + |
| 11. | Merismopedia punctata Meyen | - | + |
| 12. | Merismopedia minima Beck. | + | + |
| 13. | Merismopedia elegansLemm | - | + |
| 14. | Microcystis aeruginosa Kuetz. | + | + |
| 15. | Microcystis protocystis Crow | - | + |
| 16. | Microcystis flos-aquae (Wilttra) Kirchner | - | + |
| 17. | Microcystis elongata Desikachary | + | + |
| 18. | Synechococcus elongatus Nag | + | + |
| 19. | Arthrospira platensis (Nordstedt) Gomont | + | + |
| 20. | Lyngbya spiralis Geitler | + | + |
| 21. | Oscillatoria formosa Bory ex Gomont | + | + |
| 22. | Oscillatoria limosa Ag. Ex Gomont | - | + |
| 23. | Oscillatoria princeps Vaucher ex Gomont | - | + |
| 24. | Oscillatoria tenuis Ag. ex Gomont | + | + |
| 25. | Oscillatoria sancta (Kuetzing) Gomont | + | + |
| 26. | Phormidium fragile (Meneghini) Gomont | + | + |
| 27. | Anabaenopsis circularis (G.S.West)Wolosz. et Miller | + | + |
| 28. | Anabaena orientalis Dixit. | + | + |
| 29. | Nostoc commume Vaucher ex Born. et Flah. | + | + |
| 30. | Nostoc muscorum Ag. | - | + |
| 31. | Anacystis sps | + | + |
| 32. | Rivularia aquatica De Wilde. | + | + |
| | **CHLOROPHYTA** | | |
| 33. | Ankistrodesmus falcatusvar.acicularis(Corda.) | - | + |
| 34. | Ankistrodesmus convolutesCorda. | + | + |
| 35. | Chlorococcum humicola (Nag.) Raban. | + | + |
| 36. | Chlorella vulgarisBayernick | + | + |
| 37. | Coelastrum indicum Turner. | + | + |
| 38. | Hydrodictyon sps | - | + |
| 39. | Crucigenia tetrapedia(Kirchner) | + | + |
| 40. | Pediastrum angulosum (Ehr.) Menegh. | + | + |
| 41. | Pediastrum duplex Lagerheim | + | + |

| | | | |
|---|---|---|---|
| 42. | Pediastrum integrum Nagelli | + | + |
| 43. | Pediastrum tetras (Ehr.) Ralfs. | - | + |
| 44. | Botriyococcus sps | - | + |
| 45. | Scenedesmus armatusvar.bicaudatusSmith. | - | + |
| 46. | Scenedesmus bijugatusvar.alternansKuetz. | - | + |
| 47. | Scenedesmus quadricaudavar.quadrispiniaBreb. | + | + |
| 48. | Tetraedrongracile(Rein.) Hansgirg | - | + |
| 49. | Tetradporu Sps | - | + |
| 50. | Ulothrix zonata(Kuetz) | + | - |
| 51. | Oedogonium hispidumNordstedt | + | + |
| 52. | Closterium acerosum (Schrank.) Ehr. | - | + |
| 53. | Closterium ehrenbergii (Menegh.) ex Ralfs. | + | + |
| 54. | Cosmarium turgidumRalfs | + | + |
| 55. | Netrium digitus (Ehrenberg) Roth. | + | + |
| 56. | Pithophora sps | - | + |
| 57. | Spirogyra gratiana Transean. | - | + |
| | **BACILLARIOPHYTA** | | |
| 58. | Amphora ovalis Kuetz | + | - |
| 59. | Cymbella lanceolata Breb. | - | + |
| 60. | Fragilaria intermedia (Grun.) | + | + |
| 61. | Gomphonema lanceolatum Her. | + | + |
| 62. | Navicula cuspidate Kuetz | + | + |
| 63. | Navicula radiosaKuetz. | + | - |
| 64. | Navicula halophilakuetz. | + | - |
| 65. | Navicula viridulaKuetz | + | + |
| 66. | Achnanthes inflata | + | - |
| 67. | Pinnularia simplex Ehr. | + | - |
| 68. | Pinnulariaviridis (Nitzsch.) Ehr. | + | + |
| 69. | Synedra ulna (Nitzsch.) Ehr. | + | - |
| 70. | Diatoma Sps | + | - |
| 71. | Suriella elegansEhr. | - | + |
| 72. | Tabellaria flocculosa (Roth) Kuetz. | + | + |
| | **EUGLENOPHYTA** | | |
| 73. | Euglena gracilis Mallisch | - | + |
| 74. | Euglena sanguine Ehrenberg | + | + |
| 75. | Phacus aribicularis Var. Caudata | + | + |
| 76. | Phacus cylindricusPochmann | + | + |
| 77. | Phacus curvicauda Swir. Skz. | + | + |
| 78. | Trachelomonas volvocina Ehr. | - | + |

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